Rapid Alternation CFL-Induced Liquefaction of 2-D Nanomaterials in Support of Novel Photonic Memristor Processing Concept

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Introduction

The ability to render ordinarily solid metallic substances as liquid without alteration of their temperature (ibid. 22 February 2024) opens up the possibility of applying this technique toward the end of supporting novel photonic computing strategies.

Abstract

As we seek to unify the distinct advantages afforded by both non-binary computing (sometimes termed quantum computing) in which values beyond 'zero' and 'one' can be represented in a single transistor and other computer types including MOSFET binary computers and optical transistor photonic binary computers, one must recognize that the revolutionary capability of utilizing alternating Coulomb Force Lines to render solid materials as liquids switchably and rapidly has application in the field of computing.

Spaced sheets of parallel, optically-reflective-when-solid and optically-transparent-when-liquid metamaterials may, with the aid of the aforementioned Rapid Alternation CFL-Induced Liquefaction System (or simply ILS, for short) enable the trapping of light as well as the mitigation of accepted light in terms of intensity followed by the controlled release of light after a number of reflections between the sheets. The ability to render certain semiconductor molecules as free to rotate on their own axis would, even without a physical flipping of a bicameral material, for instance, alter the magnetic properties of the optical properties of the molecules and thus alter its relationship with light without the need to actuate the molecules physically by rotation (a process too slow to support revolutionary computing.) When water freezes or melts, to cite a well-known example, its optical properties change. Ordinarily, freezing or melting is a gradual process driven by changes in temperature which require time. If the state of an ordinarily solid material can be altered using a force carried at light speed irrespective of temperature, new possibilities for rapid alternation of the property of reflectivity/transparency are created. For instance, light could be either permitted or blocked from entering/exiting the reflection zone between the sheets by temporarily rendering either one, the other, or both of the sheets as liquid using Rapidly Alternating Coulomb Force (RACF.) Partial liquefaction could be used to permit the entry or exit of specific proportions of accumulated light relative to the totality of stored photonic energy.

Although these pairs of sheets would be somewhat larger than existing MOSFETs, the ability for these reflection zones to temporarily store light of

variable intensity enables each transistor to represent numbers beyond zero and one. Much like an SSD, the intensity of light would be used to define the state of the transistors. The degree of liquefaction could be made to be variable in order to enable control of the increment of charge increase to each individual *photonic memristor* so as to control the extent of increase (or decrease) in each charge cycle. This means that any photonic memristor operating along these lines could be set to virtually any light intensity state in a single processor cycle and could feature a mixture of fixed and variable dynamics as well as dynamics which different from one photonic memristor zone to the next.

Light intensity at the end of each cycle can be checked without entirely disbursing stored light (enabling multi-cycle dynamic cognition) by releasing only a portion of stored light from each of these transistors in each cycle. Something more akin to an imitation of human cognition could be achieved by setting different clusters of transistors to bleed off differing amounts of light in each cycle programmatically so as to create a system in which some photonic memristors would have a "longer memory" than others. Such a dynamic mode of function enabling highly complex computations comparable to those performed by human neural tissue would, in addition to bestowing upon the user the advantages of *both* quantum and optical computers, confer the advantages associated with neuromorphic computers and would obviate the onerous engineering challenges typically associated with integrating different sorts of ASICs including bio-mimetic synthetic neurons in hybrid processors.

Conclusion

Just as the integrated circuit revolutionized computing in 1960 by miniaturizing all of the necessary components of a processor and reducing the space, power and cost requirements for building powerful computers, photonic memristors with a Multi-Cycle Dynamical Mode of Function (MCDMF) provide a best-of-all-worlds advantage with respect to advantages typically thought of as unique to quantum (e.g. larger maximal integer size,) optical (e.g. greater maximal speed of data flow and switching) and neuromorphic (e.g. hardware-enabled synthetic cognition and introspection) processor types respectively.